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THE "RHYTMME" PROJECT IN MOUNTAINOUS AREAS USING X-BAND WEATHER RADARS

SOME PRELIMINARY RESULTS OBTAINED FOR FLASH FLOOD WARNING

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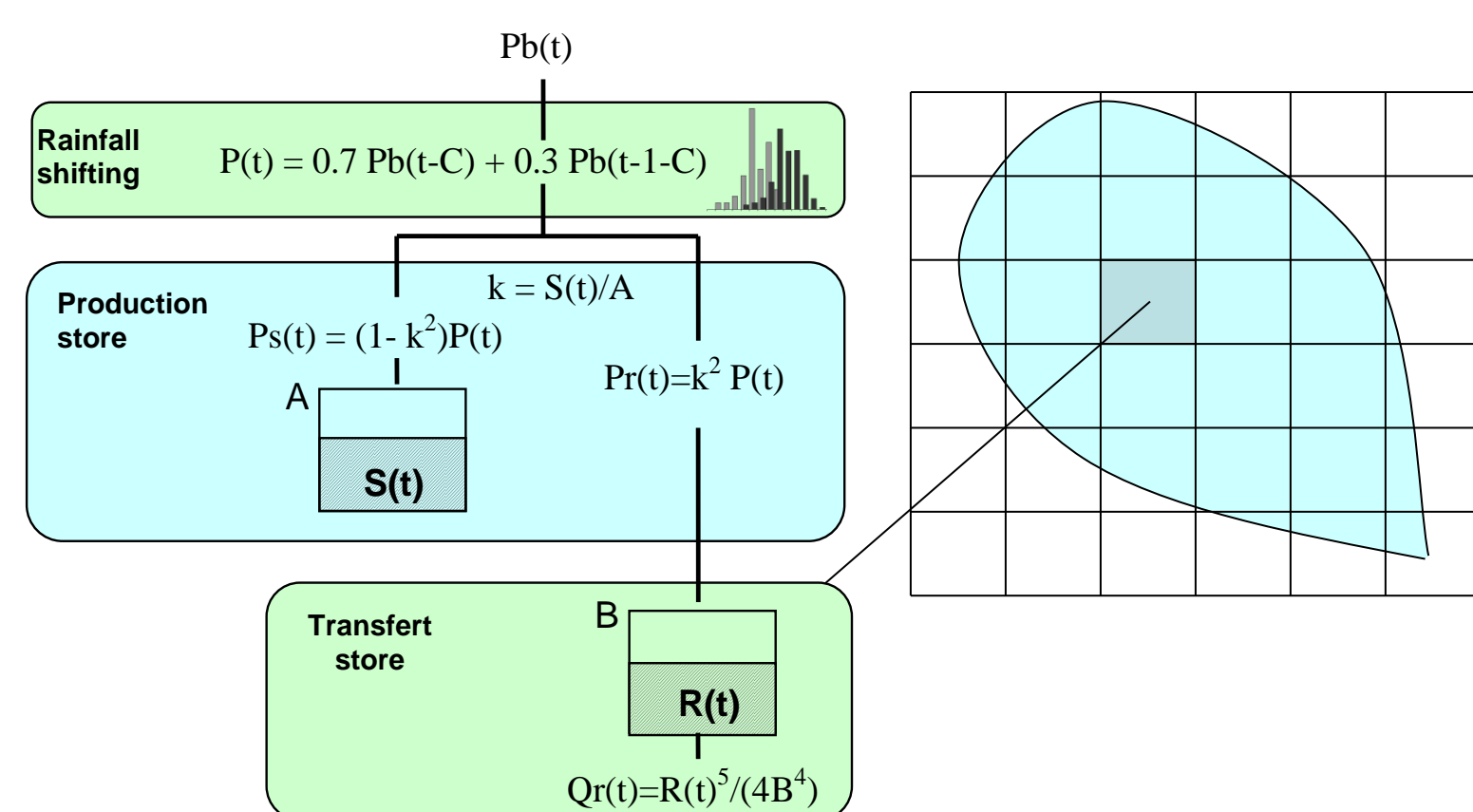
THE RHYTMME PROJECT

In most cases, natural hazards encountered in mountainous areas are largely dependent on precipitations: flash floods, debris flows, landslides, rock falls, snow avalanches. However, the knowledge of rainfall quantities still remains a tricky issue: the available rain-gauges are in a limited number and most often located in the valleys, and the radar rainfall estimates have to deal with a lot of problems due to the relief and the difficulty to distinguish the different types of hydrometeors (snow, hail, rain). In this context, the "RHYTMME" project aims at:

- Providing an accurate radar rainfall information in mountainous areas.
- Developing a real-time hazards warning system based on this information.

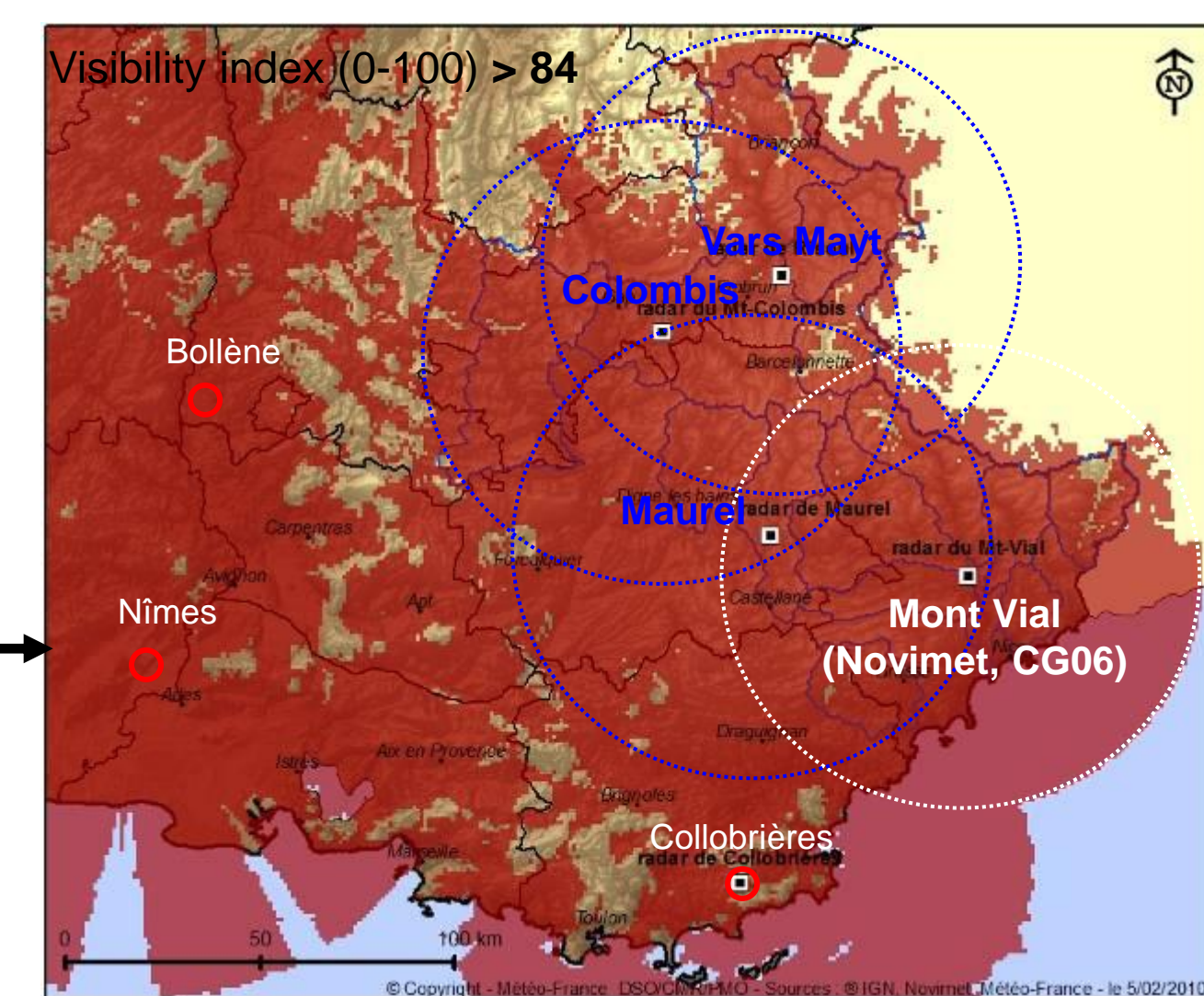
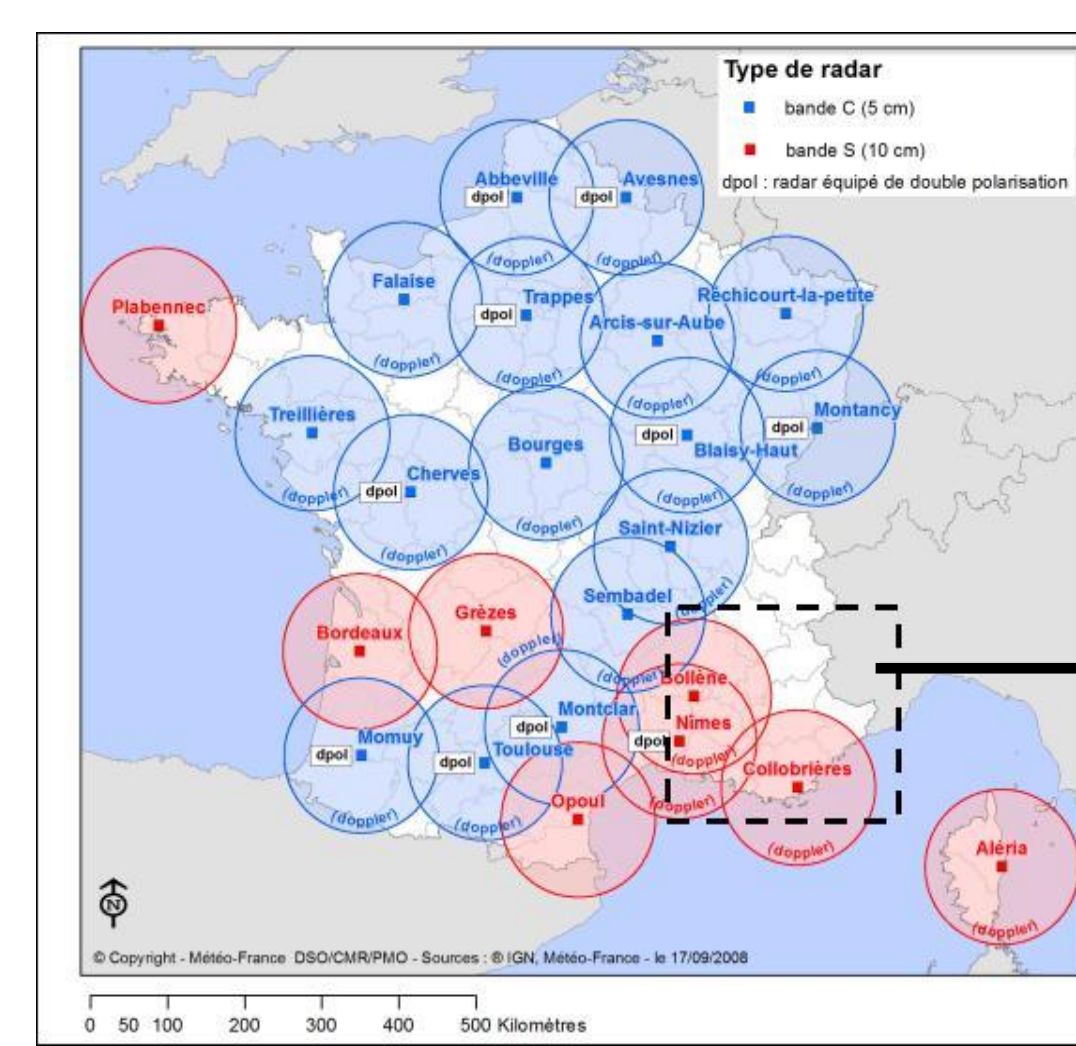
Actual project achievement

- Installation of X-band Doppler polarimetric radar in the Southern Alps at Maurel mont in addition to the already existing X-band radar from Mont Vial (at the end of the project, a network of 4 X-band radar will be operational)
- Capability to visualise rainfall accumulations in real time and on fine scales
- Display of the danger gravity levels corresponding to various hazards, made available in real time to local risk managers via the Internet

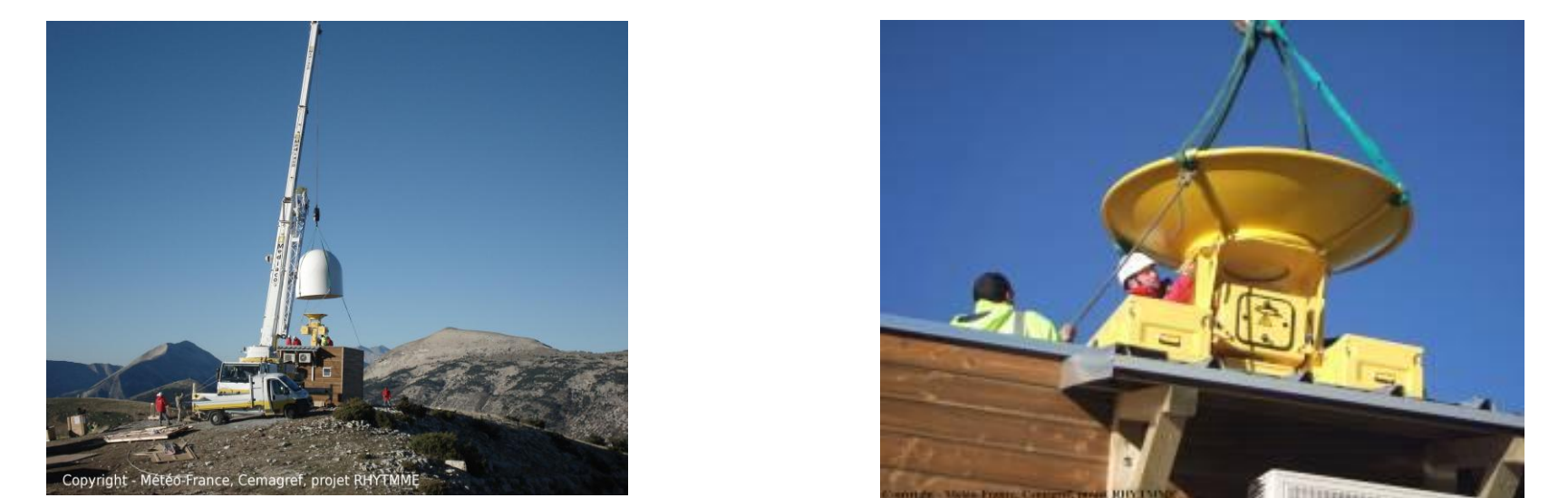


flash flood warning system

- using AIGA method, comparing the flood peak to a threshold
- Simple event-based conceptual model
- Limited numbers of regionalized parameters



ARAMIS network and the RHYTMME network development.



Installation of Mont Maurel radar (05) inaugurated the 23 May 2011

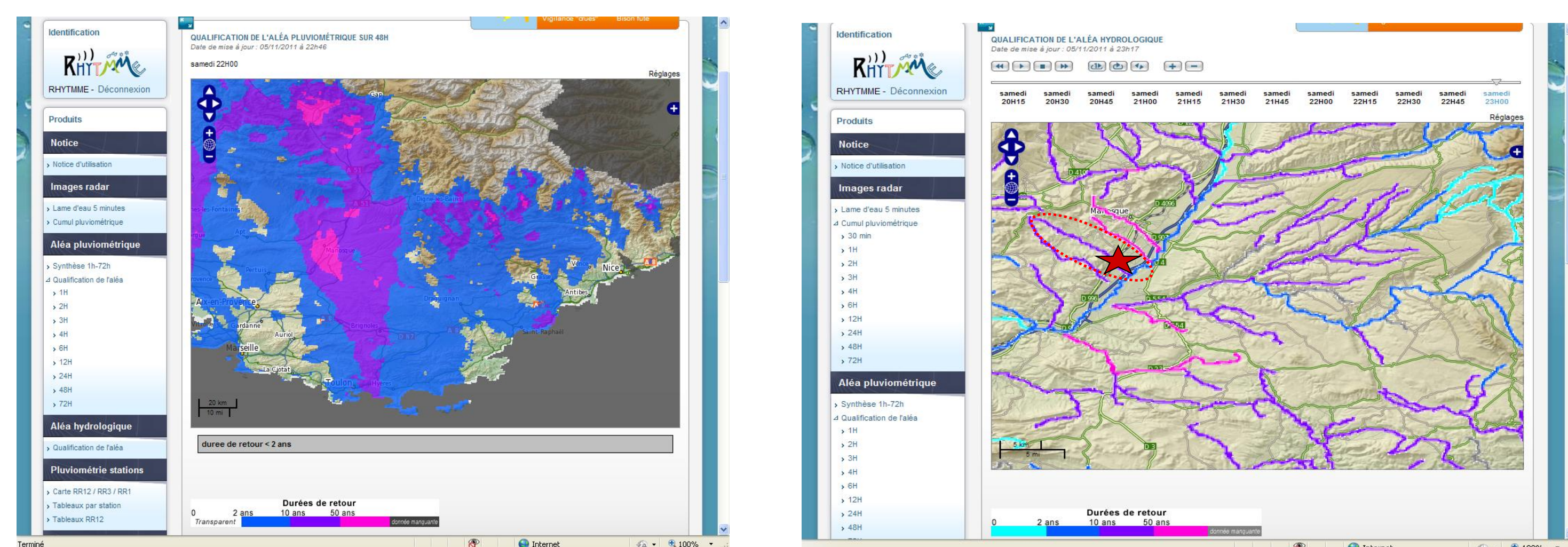
FIRST RESULTS: COMPARISON TO DAMAGES REPORTS

Real-time events evaluation by end-users

End-users club

- Composed by departmental offices for Restoration of Mountainous Territories (RTM), local authorities and councils of local communities, river associations, SNCF...

Screen-shot of the platform during the 5 Nov. 2011 evening



Rain (left) and discharge (right) hazard warning maps indicating the return period of the on-going event.

★ Train accident caused by a flash flood at 18:00, reported by the SNCF

Damages reported by SNCF

- Ballast carried over 150m (1)
- 2 vehicles carried on the railway
- Accident between 1 car and the train (2)

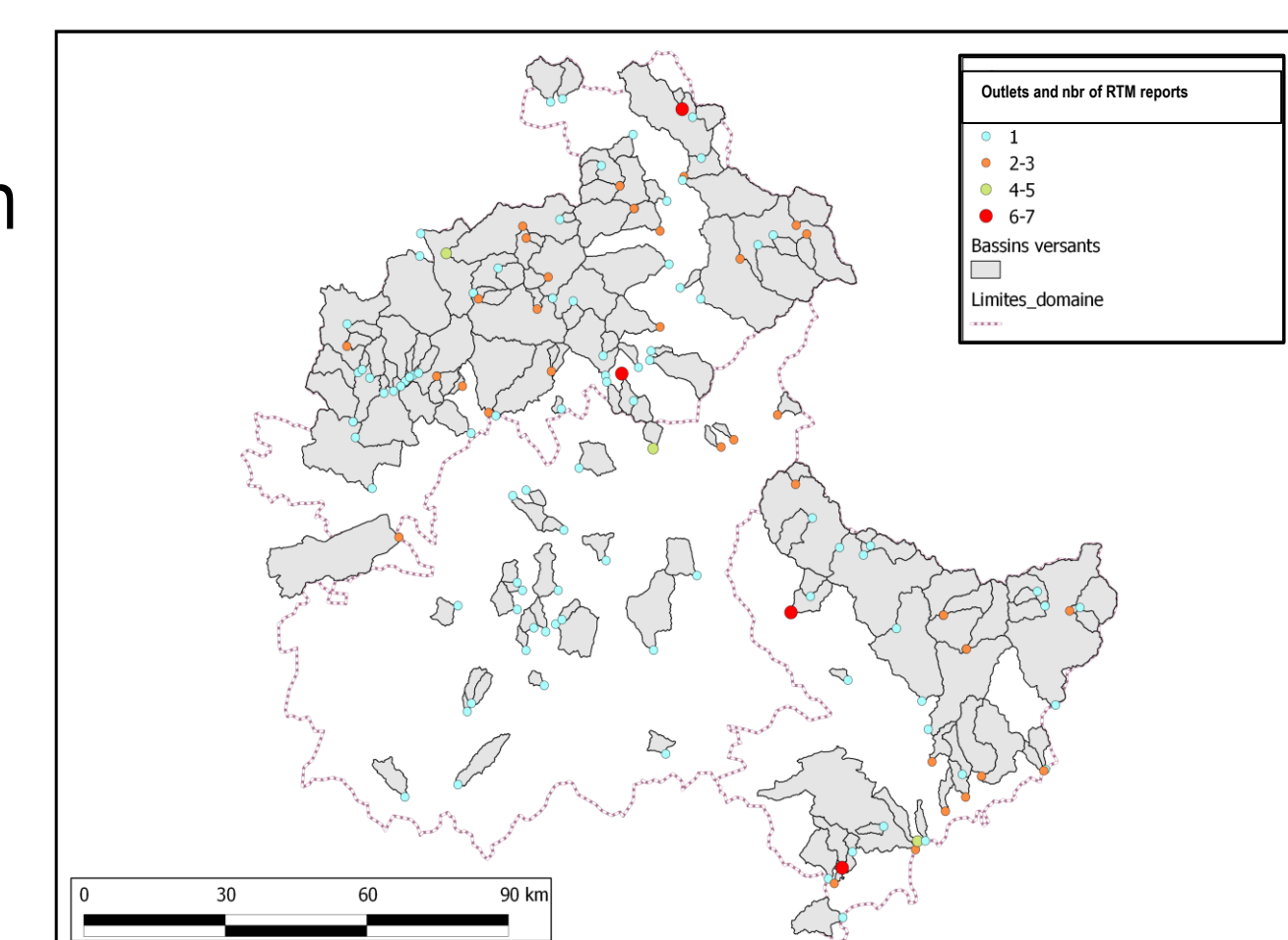
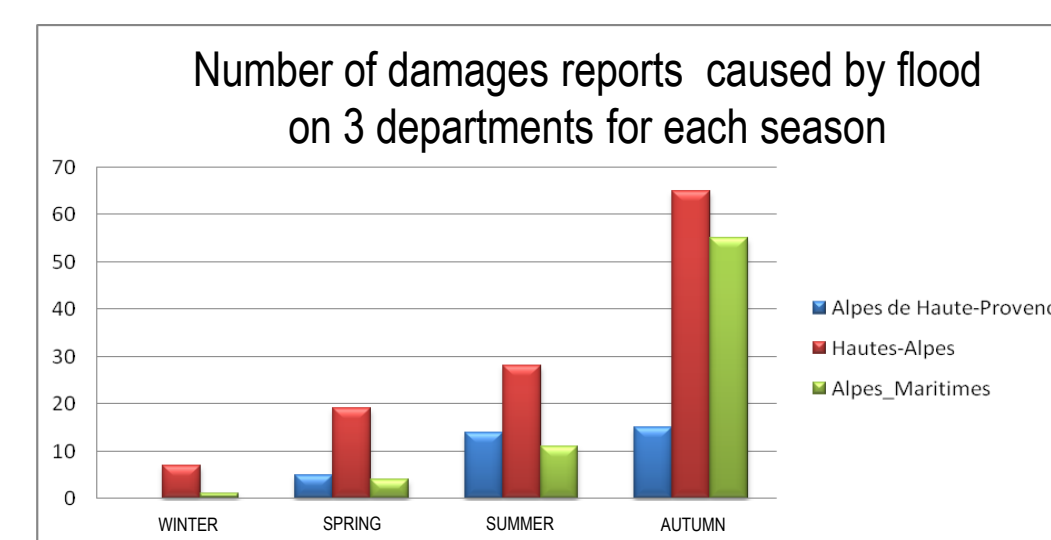


Picture by SNCF

Picture by SNCF

Available data

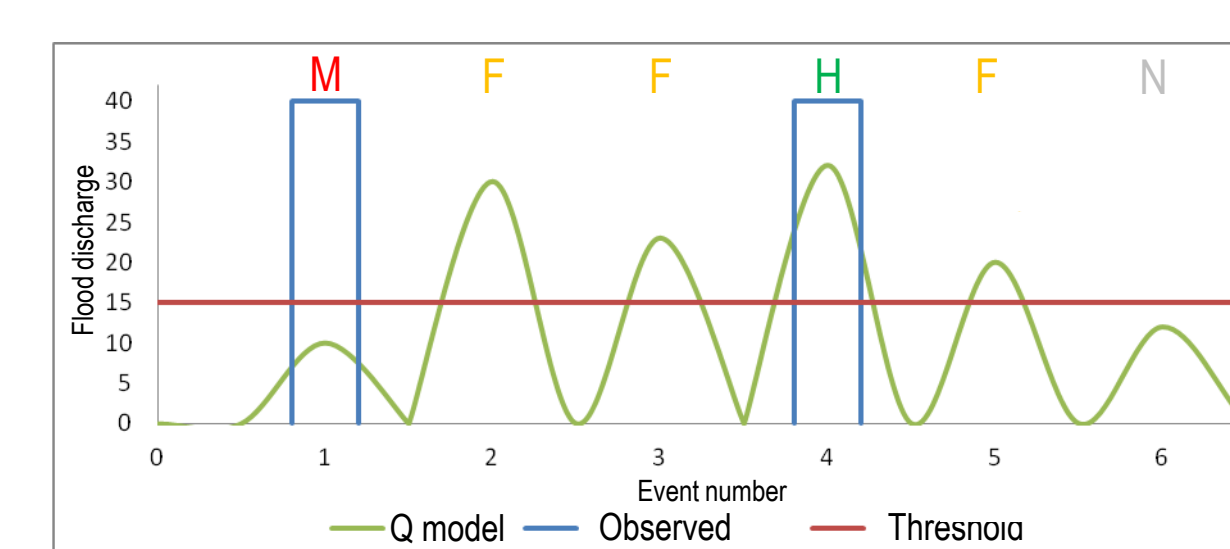
- Reanalysed rainfall by Meteo-France over 10 years
- Damages reports from « Restauration des Terrains en Montagnes » services (RTM) for 139 catchments



Localisation and number of flood reports between 1997 and 2006 extracted from the historical data-base (RTM)

Methodology and first results

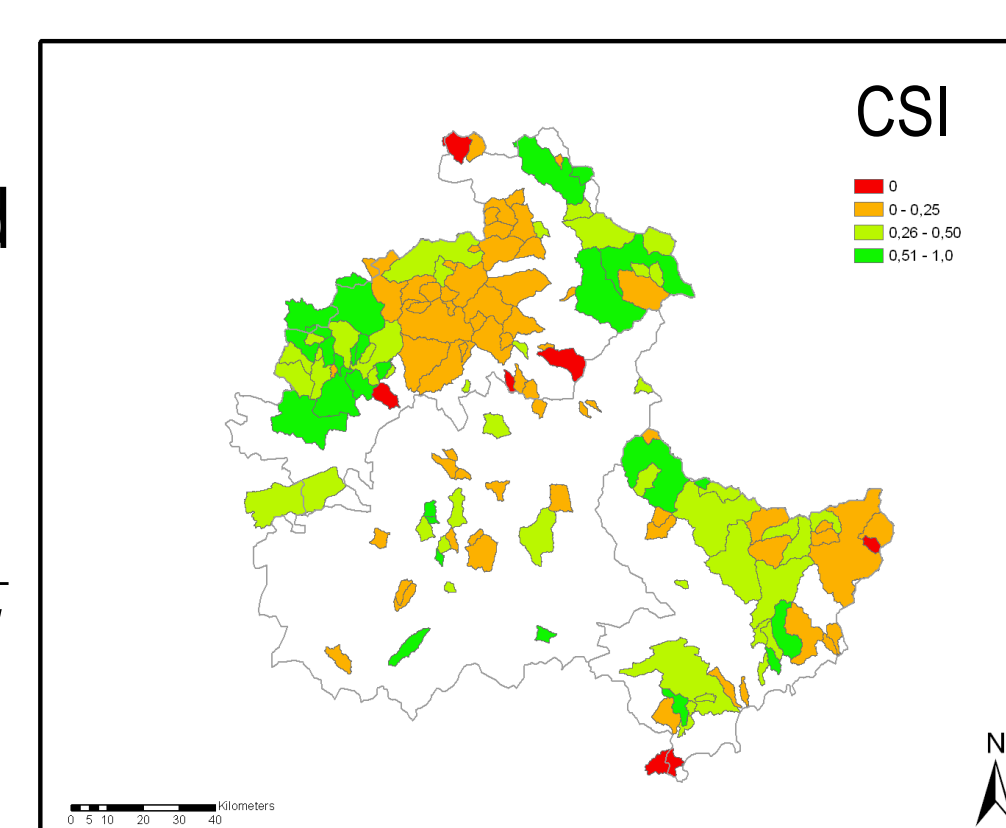
- Issuing an alert when modelled discharges exceed a threshold
- Comparing modelled alert to observed event into the data-base
- Determining the optimal performance by adjusting the threshold



H = Hit M = Missed
F = False N = No Alarm

$$CSI = \frac{\sum H}{\sum H + \sum M + \sum F}$$

Performance criterion:
Critical Success Index



Preliminary CSI results for optimal threshold for each catchment

Financial partners (under the State-Region Contracts Project (CPER) 2007-2013):



Provence-Alpes-Côte d'Azur



European commitment to PACA (Provence-Alpes-Côte d'Azur, Corsica) through the European Regional Development Fund



- **Technical or scientific partners:** departmental offices for Restoration of Mountainous Territories (RTM) of O.N.F., Centre for Technical Studies on Equipment (CETE Méditerranée)
- **Regional and local partners:** decentralised state services (Regional Environment Development and Housing Directorate (DREAL) PACA, Departmental Land Divisions (DDT) and the Departmental Fire and Rescue Service (SDIS), local authorities and councils of local communities, general councils, river associations, nature parks, flood forecasting services (SPC), etc.
- **Industrial partners:** Novimet, Selex, EDF, SNCF, Prédicit Services